

1972

4-4

OLD RIVER CLOSURE

This memorandum is to document the activities of the Department regarding the closure of Old River near its head by the construction of a temporary rock control structure. The objective of this closure is to promote salmon migration up the San Joaquin River by providing positive downstream flow and by eliminating a deficiency in dissolved oxygen near Stockton.

In accordance with the Interagency "Memorandum of Understanding of Interim Measures to Protect Fish in the Sacramento-San Joaquin River Delta Prior to the Construction of the Peripheral Canal", dated March 10, 1969, the responsibilities of the involved agencies as they relate to the Old River Closure are as follows:

The Department of Water Resources will be responsible for the construction and removal of the control structure at the head of Old River. Funds are available for this purpose in Division of Operations and Maintenance budget for 1972-73, and work will be done under contract by the Division of Design and Construction. Monitoring of the dissolved oxygen content in the San Joaquin River to determine the need for flow augmentation will be handled by the Central District as a participant to Division of Operations and Maintenance. The District will also obtain the necessary permits and coordinate the overall activity.

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Flow augmentation through the Delta Mendota Canal wasteways is the responsibility of the U. S. Bureau of Reclamation. When necessary, the Bureau is prepared to augment the flow in the San Joaquin River up to a total of 60,000 acre-feet.

The Department of Fish and Game is responsible for evaluation of these protective measures in coordination with the Bureau of Sport Fisheries and Wildlife. Fish and Game is also responsible for planting salmon stock and for monitoring temperature conditions in upstream areas.

Telephone conversations between the Division of Operations and Maintenance, the Department of Fish and Game, and the Bureau of Reclamation in June of 1972, determined that construction of a control structure would be necessary and that the need for flow augmentation would be very likely. This decision was based on projected low flows in the San Joaquin River and predicted unsatisfactory dissolved oxygen levels in the San Joaquin River near Stockton.

Early in September, a unique situation developed which caused flows in the San Joaquin River at Vernalis to increase approximately 1,100 cfs over and above the normal flow of about 500 cfs. The increased flow was the result of a partial dewatering of Exchequer Reservoir, from September 5 to October 7, to allow repair work to be done on the face of the dam. With a flow at Vernalis of 1,600 cfs and a combined pumping rate of about 7,000 cfs at the Tracy and Delta Pumping

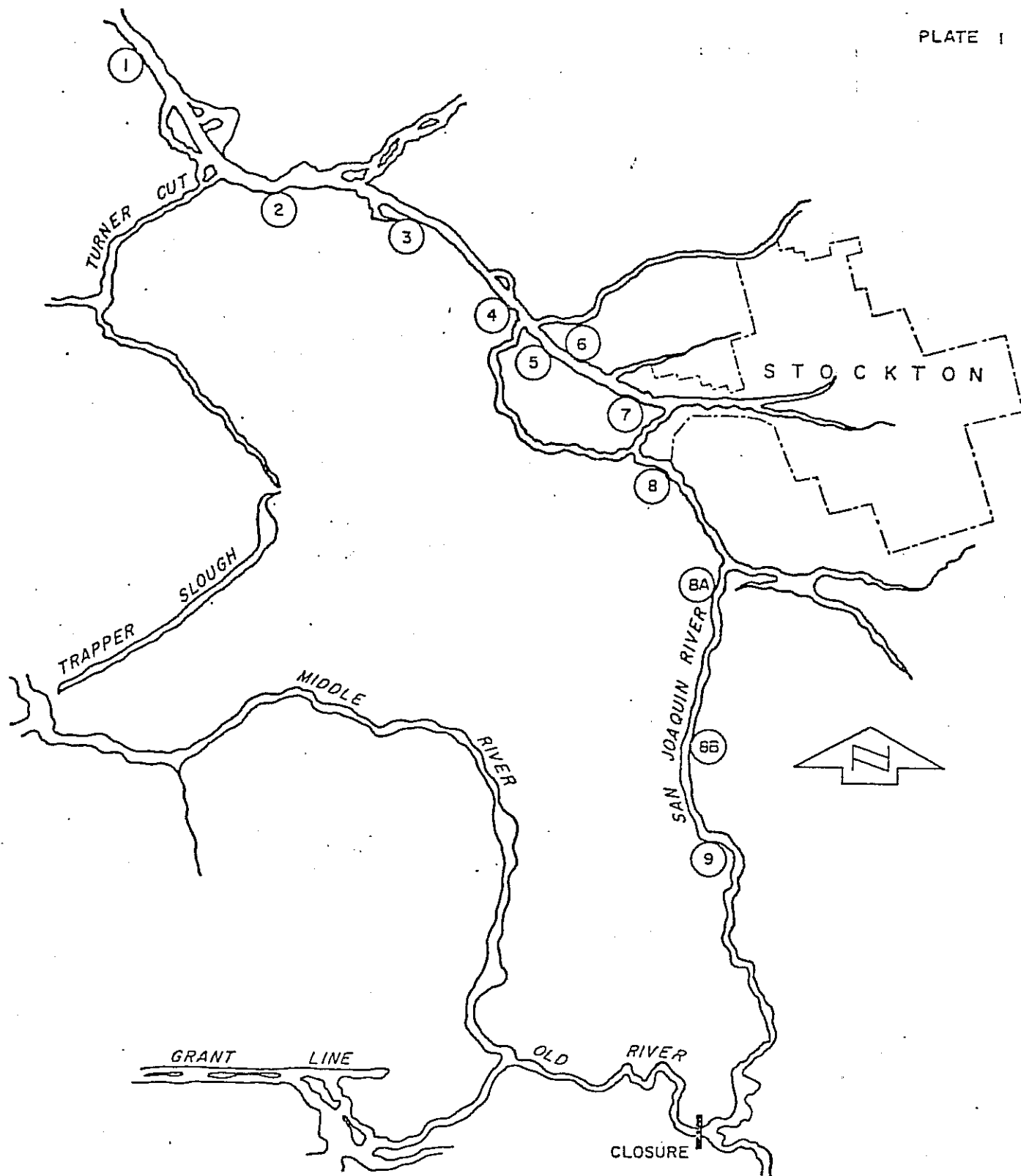
Plants, it was determined, using the distribution curve of flow at the head of Old River,^{1/} that approximately 96 percent of the flow went down Old River and that the remaining 4 percent (65 cfs) down the San Joaquin River.

Construction of the control structure was started September 25, and completed September 29, 1972. Removal was started November 7, and completed November 10, 1972.

In order to document changes in water quality resulting from the construction of the control structure, an interagency water quality monitoring program was organized and implemented. The monitoring program extended from September 13, to November 17, 1972, and consisted of 10 dissolved oxygen sampling runs on the San Joaquin River from Light 18 near Turner Cut to Brandt Bridge, and weekly retrieval of dissolved oxygen data from the DWR continuous recorder at Rough and Ready Island. Plate 1 indicates the approximate location of the sampling stations.

Two sampling runs were made prior to the construction of the control structure, one during the construction period six while the control structure was in, and one after the control structure's removal. Values collected on these runs are presented in Table 1, and also a graphical presentation is shown on Plate 2. On September 14, a continuous profile of dissolved oxygen values was run beginning at Light 18 and

^{1/} Salinity Incursion and Water Resources Appendix to Bulletin 76, Plate 11.



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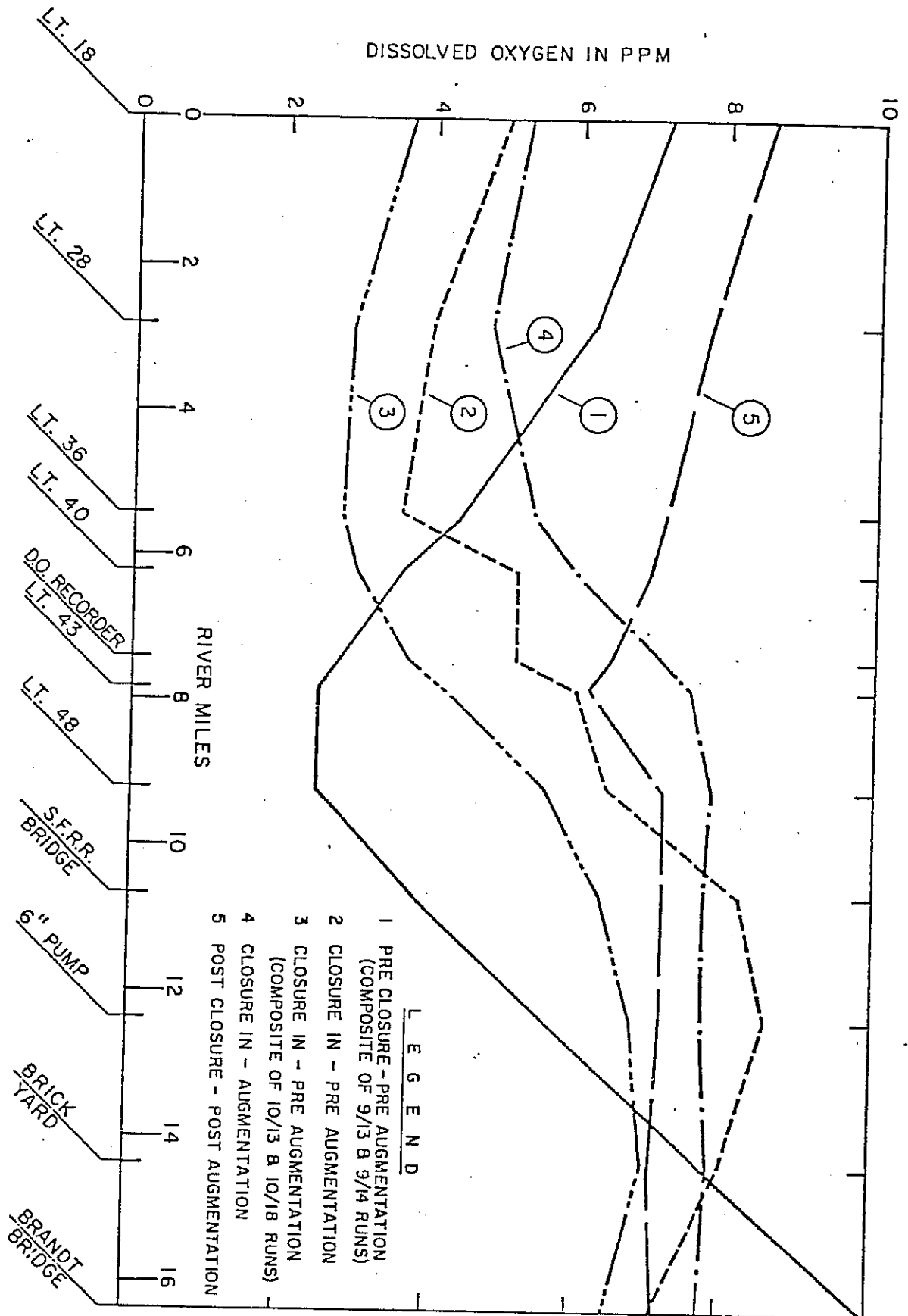
- | | |
|----------------------|----------------------|
| 1 LIGHT 18 | 7 LIGHT 48 |
| 2 LIGHT 28 | 8 SANTA FE RR BRIDGE |
| 3 LIGHT 36 | 8A 6" PUMP |
| 4 LIGHT 40 | 8B BRICK YARD |
| 5 CONTINUOUS MONITOR | 9 BRANDT BRIDGE |
| 6 LIGHT 43 | |

SAN JOAQUIN RIVER NEAR STOCKTON
SAMPLING STATIONS

TABLE 1
DISSOLVED OXYGEN VALUES FROM SAMPLE RUNS
(Values are in ppm)

Station	Date									
	9/13	9/14	9/28	10/4	10/13	10/18	10/25	10/27	11/1	11/17
1. Lt. 18	7.7 7.4	6.8 6.7	5.5 6.0	5.1 4.8	3.6 3.4	3.9 3.8	5.4 5.2	5.4 5.4	8.0 7.8	8.6 8.7
2. Lt. 28	6.5 6.5	6.0 5.9	2.5 3.0	4.8 3.2	2.6 2.7	3.2 3.1	4.8 4.9	6.0 6.1	7.6 7.7	7.8 7.8
3. Lt. 36	4.5 5.1	3.9 3.9	2.8 2.4	3.8 3.5	2.6 2.6	2.9 2.9	5.4 5.3	7.3 7.2	7.9 7.7	7.2 7.1
4. Lt. 40	4.1 4.0	3.2 3.3	2.8 2.8	5.0 5.4	2.9 2.8	3.6 2.8	6.0 6.0	7.4 7.4	7.8 7.8	7.0 6.9
5. Cont. Recdr.	2.9 3.0	2.7 2.6	4.1 4.2	5.9 4.5	3.5 3.4	4.3 3.7	7.3 7.2	7.7 7.7	7.9 7.6	6.6 6.4
6. Lt. 43	3.0 2.6	2.3 2.2	4.7 5.1	6.5 5.5	3.7 3.6	5.5 4.2	7.6 7.6	7.7 7.7	7.6 7.5	6.5 6.0
7. Lt. 48	2.5 3.1	2.2 2.2	4.8 4.7	6.9 6.1	4.8 4.8	6.7 6.0	7.9 7.9	7.8 7.8	7.4 8.5	7.2 7.3
8. S.F.R.R. Bridge	3.9 3.6	3.9 4.0	5.8 5.6	8.3 8.3	5.6 4.9	7.3 7.6	7.9 7.8	8.0 7.8	9.9 9.7	7.3 7.2
8A. 6 In. Pump				9.0 8.1	5.8 5.8	8.0 7.7	7.9 7.9	7.7 7.7	9.9 10.1	7.2 7.1
8B. Brick Yard			5.2 5.3	8.2 7.9	5.9 5.8	8.7 7.6	7.8 7.7	7.5 7.6	9.8 9.9	7.1 7.1
9. Brandt Bridge	10.4 10.6	9.1	4.4 5.3	7.2 7.0	5.6 5.5	7.6 7.4	7.9	7.7	9.5	7.2

Note: First number 3 feet below water surface. Second number 3 feet above bottom from 9/13 through 10/18 and 20 feet below water surface on and after 10/25.



DO CONDITIONS IN SAN JOAQUIN RIVER, NEAR STOCKTON, DURING STUDY PERIOD

extending to Brandt Bridge. This run indicated that no unusual conditions existed between sampling points and that the sampling point profile would be adequate for future runs.

Run times were as close to low slack water and sunrise as feasible. Sunrise was used since the lowest dissolved oxygen values could be expected at around daybreak due to the extended night time period of nonphotosynthetic production. Low slack water was used because during this tide condition, the length of the sag was expected to be at its maximum. In the first 6 runs, samples were taken at 3 feet above the bottom and 3 feet below the surface and on the last 4 runs, at 3 feet and 20 feet below the surface. Change in measurement depth was decided upon by mutual agreement between the Department of Fish and Game, the Bureau of Reclamation, and the Central District. It was decided that if dissolved oxygen concentrations were acceptable within a 20 foot column of water that this would be sufficient for the migration of salmon.

Tidal cycle measurements were made on October 5, to determine the flow split with the closure in place. This measurement showed 33 percent of San Joaquin River flow down Old River and the remaining 67 percent continuing down the San Joaquin River past Stockton. Average flow in the San Joaquin River below the closure during the tidal cycle measurement was approximately 1,800 cfs.

On October 18, 3 weeks after the closure and 1-1/2 weeks after the dewatering of Exchequer, a sample run was made which showed the existence of unsatisfactory dissolved oxygen conditions between Light 13 and Light 43 on the San Joaquin River. As a result of these conditions, a meeting of interested parties was called on October 20, 1970. It was decided at this meeting that immediate action was needed to bring dissolved oxygen levels to an acceptable limit for salmon migration, this being a minimum of 5 ppm.

The method by which this was accomplished was for the USBR to augment the flow in the San Joaquin by releases from the Delta Mendota Canal through the Newman Wasteway. Beginning at 1300 on October 20, and continuing until 1430 on October 27, 1970, a release of 1,500 cfs was made from the Delta Mendota Canal. Total augmentation amounted to 21,011 acre-feet. Using the ratio of the October 5, tidal cycle measurement, this brought the average flow in the San Joaquin River below the closure from about 750 cfs to about 1,750 cfs.

A sample run was made on October 25, which showed that a sag still existed in the vicinity of Light 18 to Light 43. But in this case, minimum dissolved oxygen concentrations of the sag were within acceptable concentrations, i.e., above 5 ppm. Following this run, three more runs were made with all showing acceptable concentrations of dissolved oxygen and a lessening of the sag.

Based on our interim analysis of the monitoring program data, it appears that the objective of providing suitable water quality for the migration of salmon, was met.

Table 13

DATES OF OLD RIVER CLOSURE AND SUMMARY OF ITS EFFECTS

Year	Barrier Construction		Barrier Removal		Date Measured	Flow Split		San Joaquin Flow* (cfs)	Before Closure
	From	To	From	To		Old River	San Joaquin River		
✓1970	10/1	10/6	11/13	11/14					
✓1971	9/24	10/1	11/8	11/12					
✓1972	9/25	9/29	11/7	11/10	10/5	33%	67%	2,280	
✓1973	10/1	10/5	11/14	11/15	10/9	50%	50%	3,000	With 1,750 cfs at Vernalis and 6,000 cfs SWP and CVP pumping. Flow = 1,650 cfs in Old River and 100 cfs in San Joaquin River.
✓1974	9/12	9/18	11/1	11/9	9/23	56%	44%	3,600	With 2,200 cfs at Vernalis and 4,700 cfs SWP and CVP pumping. Flow = 1,800 cfs in Old River and 400 cfs in San Joaquin River.
✓1975	9/17	9/26	11/1	11/4	10/1	64%	36%	3,200	
✓1976	10/28	11/1	11/22	11/23	11/3	63%	37%	1,150	With 1,000 cfs at Mossdale and 3,370 cfs SWP and CVP pumping. Flow = 890 cfs in Old River and 110 cfs in San Joaquin River.
✓1977		10/27		12/5					With 200 cfs at Mossdale and 365 cfs SWP and CVP pumping. Flow = 155 cfs in Old River and 155 cfs in San Joaquin River.
1979		10/1		11/29	10/10	42%	58%	2,470	
1981		10/15		11/25	10/20	34%	64%	1,230	With 1,390 cfs at Mossdale and 6,360 cfs SWP and CVP pumping. Flow = 1,563 cfs in Old River and -177 cfs in San Joaquin River (reverse flow).

* San Joaquin River flow at Vernalis, except for 1979 when flow is at Mossdale.

*Reduce to 75%
(Relative)*